ORIGINAL REPORT

# Transfusion service disaster planning

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The Mayo Clinic, in Rochester, Minnesota, recently set forth a directive to develop a Mayo Emergency Incident Command System (MEICS) plan to respond to major disasters. The MEICS plan that was developed interfaces with national response plans to ensure effective communication and coordination between our institution and local, state, and federal agencies to establish a common language and communication structure. The MEICS plan addresses multiple aspects of dealing with resource needs during a crisis, including the need for blood and transfusion medicine services. The MEICS plan was developed to supplement our current local emergency preparedness procedures and provide a mechanism for responding to the escalating severity of an emergency to deal with situations of a magnitude that is outside the normal experience. A plan was developed to interface the existing Transfusion Medicine disaster plan standard operating procedures (SOP) with the institutional and Department of Laboratory Medicine (DLMP) MEICS plans. The first step in developing this interface was defining MEICS. Other major steps were defining the chain of command, developing a method for visually indicating who is "in charge," planning communication, defining the actions to be taken, assessing resource needs, developing flowcharts and updating SOPs, and developing a blood rationing team to deal with anticipated blood shortages. Several key features of the interface and updated disaster plan that were developed are calling trees for response personnel, plans for relocating leadership to alternative command centers, and action sheets to assist with resource assessment. The action sheets also provide documentation of key actions by response personnel.
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Mayo Clinic Rochester identified the need to develop and implement an emergency response and command system that was both flexible and scalable to a variety of disasters and emergencies. The need for flexibility and scalability in such a response plan is reflected in the Joint Commission's revised emergency management standard that has recently been implemented:

> Effective January 1,2008, the emergency management standards (EC.4.10 and EC.4.20) for hospitals, critical access hospitals and long term care facilities have been revised to reflect an "all-hazards" approach to emergency preparedness that permits appropriately flexible and effective responses. The revised standards emphasize a "scalable" approach that can help manage the variety, intensity, and duration of the disasters that can affect a single organization, multiple organizations, or an entire community. They also stress the importance of planning and testing response plans for emergencies during conditions when the local community cannot support the health care organization. Over the past five years, the Joint Commission has studied a variety of disasters that impacted health care organizations, including floods, widespread electrical utility outages, the terrorist attacks of September 11, the four back-to-back Florida hurricanes of 2004, and the Katrina and Rita hurricanes that struck the Gulf Coast in 2005. In formulating these standards changes, the Joint Commission was debriefed by health care organizations affected by these disasters, engaged emergency management experts, served on national emergency management panels, and reviewed the current literature on emergency management. From these studies, The Joint Commission concluded that it is not sufficient to require that health care organizations plan for a single event; they should be able to demonstrate sufficient flexibility to respond effectively to combinations of escalating events.[1]

At the 2007 AABB annual meeting in Anaheim, California, we briefly described the interface we developed between the Transfusion Medicine disaster plan and the institutional Mayo Emergency Incident Command System (MEICS) plan.[2] In the following report, we detail further the MEICS plan that was developed to interface with national response plans to ensure effective communication and coordination between our institution and local, state, and federal agencies to establish a common language and communication structure. We also describe how we modified our existing Transfusion Medicine disaster plan SOP to integrate with the institutional MEICS plan while at the same time maintaining flexibility and scalability to deal with a variety of emergency and disaster responses.

## Methods

*Defining the MEICS*

The MEICS provides a standardized approach to managing emergency situations, internal crises, and external disasters. MEICS employs a logical customized management structure, defined job responsibilities, clear reporting channels, and a common nomenclature to expedite decision making and help unify Mayo Clinic with other emergency responders. MEICS is a leadership team, which is activated only when an emergent situation surpasses the normal operating capabilities of the institution or departments. When MEICS is activated, new lines of authority are enacted, with all sections taking direction from the MEICS incident commander, either directly or via the MEICS section chiefs and unit leaders.

Following down the chain of command through the operations chief, the ancillary services director provides direction to all laboratory divisions through the laboratory unit leader. Our challenge was to develop the interface between Transfusion Medicine and the laboratory unit leader so that the Transfusion Medicine disaster procedure could be modified to accommodate institutional needs (Fig. 1).

*Interfacing the Laboratory and Institutional MEICS*

Multiple meetings were held with all divisions of Laboratory Medicine, including Transfusion Medicine, to define how to interface with the institutional MEICS plan and the laboratory unit leader. The process that was developed has several key features that allow for flexibility, including the ability to relocate MEICS leaders away from their normal worksites. Upon activation of the MEICS plan, the ancillary services director will assign one of the laboratory operations managers to serve as the laboratory unit leader. If the laboratory unit leader needs to relocate to the Institutional Command Center, a second operations manager will be contacted and asked to serve as the onsite leader for the departmental laboratories, as shown in Figure 2.

*Who's in Charge?*

MEICS leaders will don red vests to visually indicate their responsibility for being "in charge" in the chain of command. This visual indicator was felt to be important because the command structure of MEICS is different from the chain of command used in normal daily laboratory operations, with which personnel have great familiarity. For example, the Transfusion Medicine medical director who is "in charge" during normal operations will not be the decision maker or information manager during a MEICS activation. Management personnel in Transfusion Medicine will be visually reminded of this difference by the presence of the red vest. One of the key lessons learned during the Katrina hurricane disaster was that there should be one single conduit through which all information and decisions flow to maintain command and control in emergency situations. Poorly defined roles and control mechanisms were cited by the White House as major flaws in the response to Hurricane Katrina:

> In terms of the management of the Federal response, our architecture of command and control mechanisms as well as our existing structure of plans did not serve us well. Command centers in the Department of Homeland Security (DHS) and elsewhere in the Federal government had unclear, and often overlapping, roles and responsibilities that were exposed as flawed during this disaster. The Secretary of Homeland Security is the President's principal Federal official for domestic incident management, but he had difficulty coordinating the disparate activities of Federal departments and agencies. The Secretary lacked real-time, accurate situational awareness of both the facts from the disaster area as well as the on-going response activities of the Federal, State, and local players.[3]

*Institutional and Departmental Communication Planning*

Once the MEICS plan has been initiated at Mayo Clinic, the laboratory unit leader will assess the situation and begin contacting the various laboratories in a tiered fashion, using a calling tree. The calling tree is reviewed quarterly for accuracy. Authorized users can obtain it by contacting the Mayo Clinic telephone operator. Authorized individuals can also access the calling tree via a Web page. The calling tree contains contact information for the various laboratory medical directors, operations managers, administrators, and departmental leadership. The MEICS calling tree allows laboratory response personnel to be contacted in a tiered fashion based on likelihood of need. For example, Transfusion Medicine is designated as a tier 1 responding laboratory because of the high likelihood of blood and blood products being required in mass-casualty emergencies. In contrast, the likelihood of an immediate need for experimental pathology services during any sort of emergency is extremely low, resulting in a tier 4 designation for that department. The tiered approach to contacting personnel

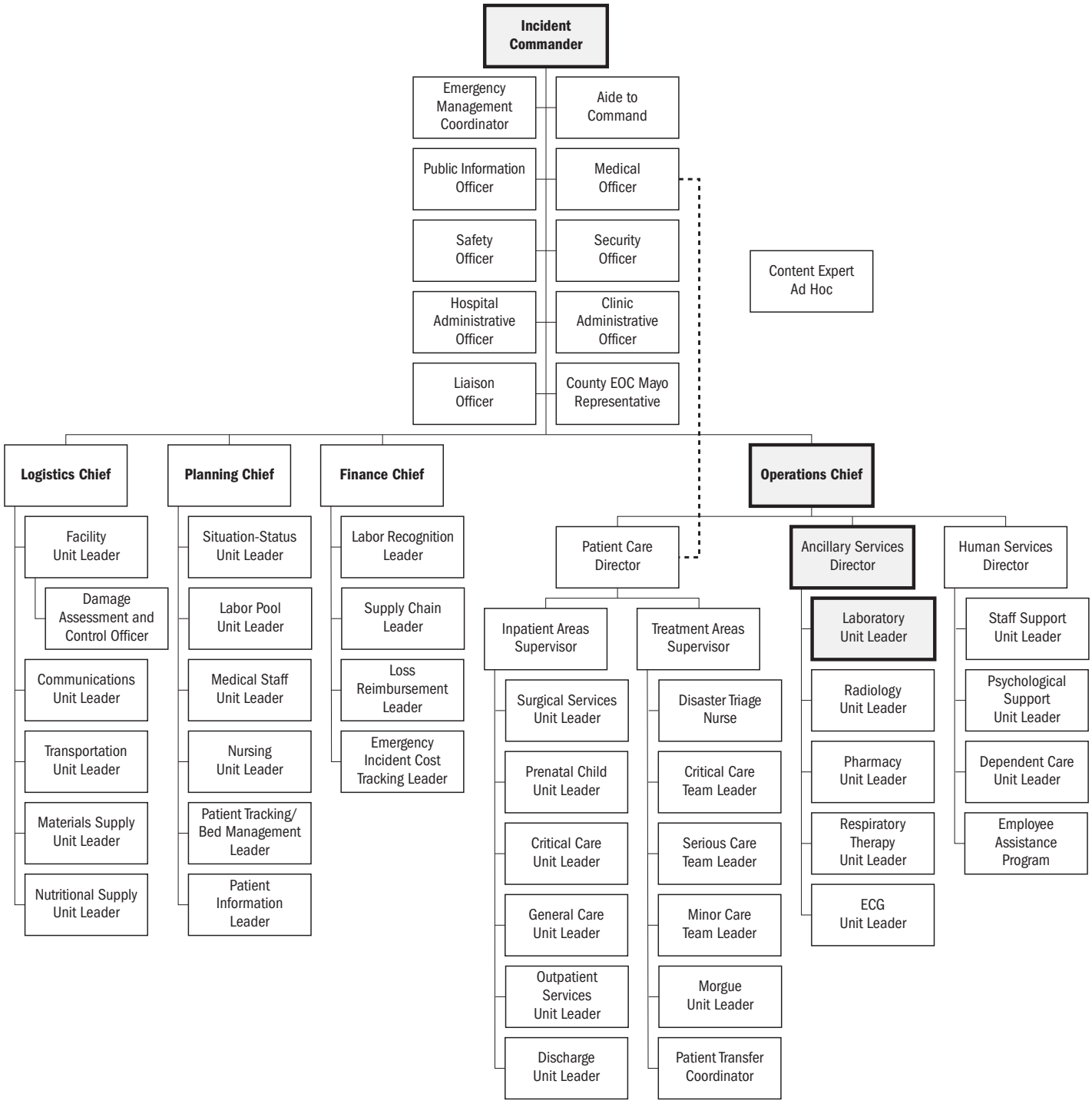


**Fig. 1. Mayo Emergency Incident Command System (MEICS) Management Structure**
MEICS uses a logical customized management structure to establish new lines of authority to provide a mechanism for responding to the escalating severity of an emergency to deal with situations of a magnitude that is outside Mayo Clinic's normal experience. An interface needed to be established between Transfusion Medicine and the laboratory unit leader. The laboratory unit leader reports to the ancillary services director. The ancillary services director reports to the operations chief, who ultimately takes direction from the incident commander.

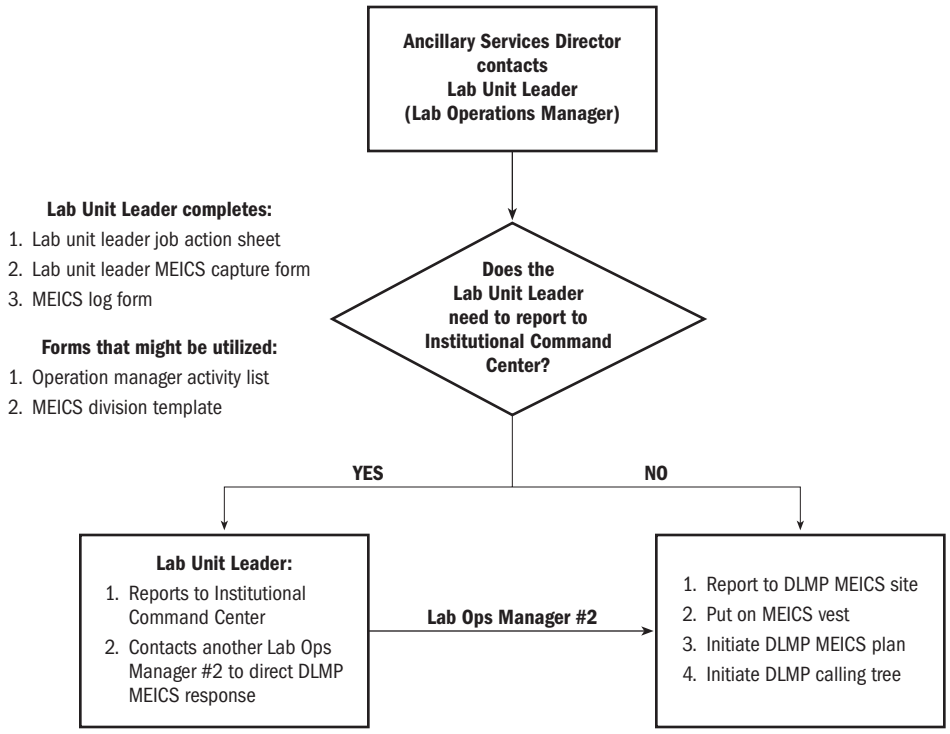


**Fig. 2. Key Features of the Mayo Clinic Department of Laboratory Medicine and Pathology (DLMP) MEICS Process and Command Structure**
Key features of the DLMP MEICS process and command structure allow for flexibility of the laboratory unit leader to relocate to the institutional command center if needed. The laboratory unit leader will contact another laboratory operations manager to serve as the onsite leader for the departmental laboratories if needed.

also minimizes unnecessary responders placing undue burden on the response plan infrastructure and resources. In case response personnel cannot be contacted, the calling tree also provides a pool of alternative contacts. Lastly, the calling tree serves as a centralized source for up-to-date contact information for response personnel, as shown in Figure 3. Phone lines may become overloaded during an emergency,and alternative means of communication may be necessary. Text messaging has the advantage that it transmits at a lower bandwidth than a cell phone call. The MEICS phone lines in the various command centers are dedicated lines with limited access. Alternatively, landline calls and wireless forms of communication can be prioritized by contacting the National Communication Systems.[4] Mayo has received Government Emergency Telecommunications Services (GETS) cards for use with MEICS. These provide a priority rating on phone calls. Two-way radios can also provide another means of communication outside of normal phone-based systems for use by key response personnel.

*Taking Action during a Disaster and Assessing Resource Needs*

Once the ancillary services director decides that the MEICS event is significant enough that the Department of Laboratory Medicine and Pathology (DLMP) will be affected, the ancillary services director will contact the laboratory unit leader and ask that the DLMP MEICS plan be activated. Action sheets were developed to assist the laboratory unit leader in documenting that key actions have taken place—those related to communications, establishing a chain of command, establishing a command center, and determining a variety of resource needs. These resources include, but are not limited to, the need for blood, transportation, inventories of critical supplies and materials, personnel, schedules, food, lodging, and types of laboratory services that will be most needed. The activities and resource need assessments listed on the action sheets are prioritized into immediate, intermediate, and extended categories. The immediate actions include these:

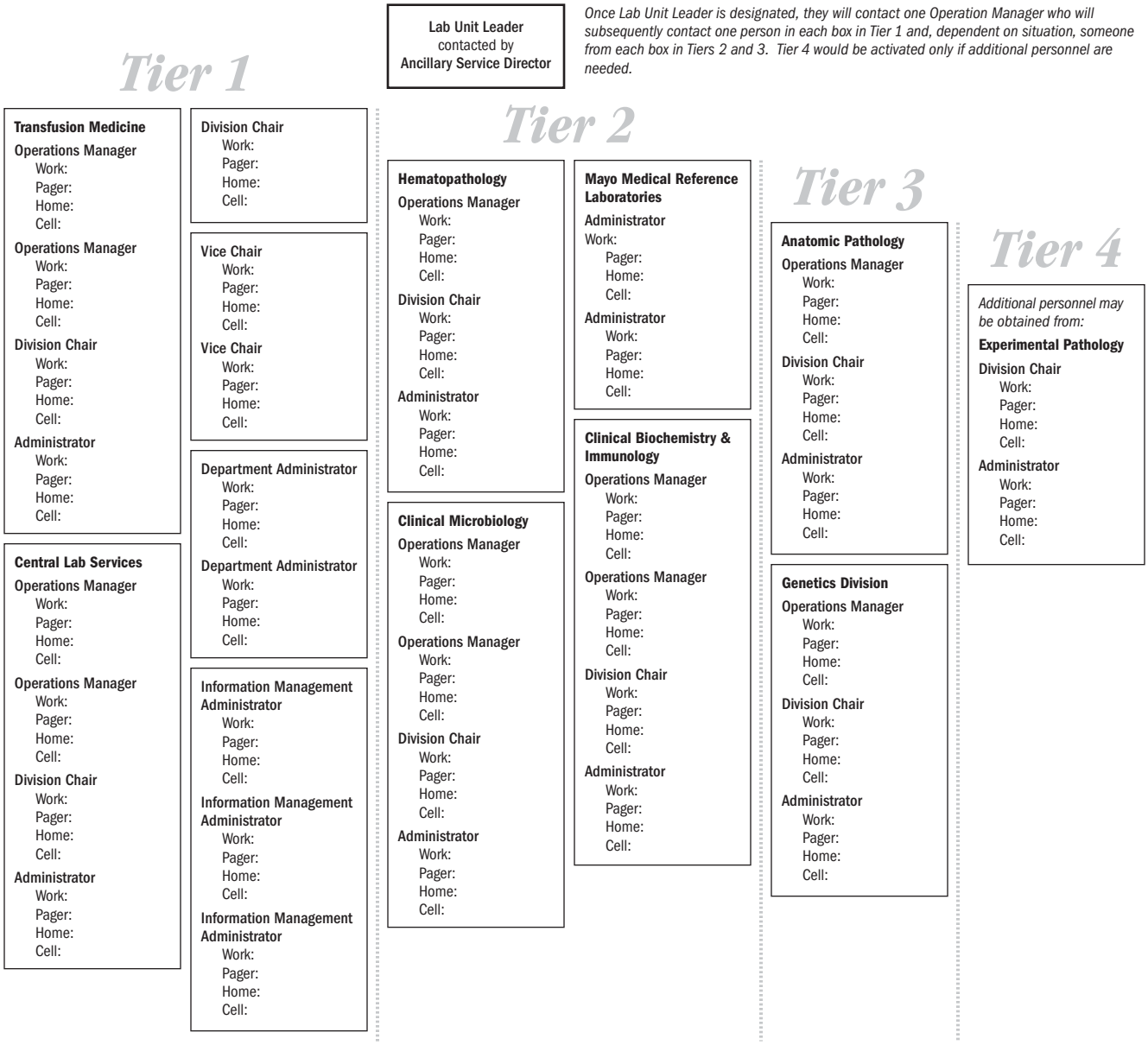


**Fig. 3. MEICS Calling Tree (names and phone numbers removed)**
A summary diagram of the MEICS calling tree form that the laboratory unit leader uses to contact the operations managers once the ancillary services director has determined that laboratory services will be needed as part of the MEICS disaster response. Operations mangers can then, in turn, contact their respective divisional medical directors and operations administrators. The MEICS calling tree allows laboratory response personnel to be contacted in a tiered fashion based on likelihood of need. This minimizes unnecessary responders placing undue burden on the response plan infrastructure and resources. In case response personnel cannot be contacted, the calling tree also provides a pool of alternative contacts. The calling tree serves as a centralized source for up-to-date contact information for response personnel and is accessible via the Mayo Clinic telephone operator. The calling tree and entire MEICS plan are reviewed and updated quarterly.

1. Activating the calling tree and documenting who was contacted for each tier
2. Establishing a DLMP command center (choose from 3 previously established sites that are stocked with emergency supplies, forms, and the red vest)
3. Donning the red vest
4. Establishing secretarial (scribe) support to do the following:
   a. Begin a journal of activities on a DLMP MEICS Log form
   b. Document needs, concerns, and decisions made
   c. Operate the tape recorder
   d. Establish a sign-in sheet for all leadership

reporting to the command center including, but not limited to, operations managers, divisional medical directors, and operations administrators.

5. Reporting to the ancillary services director on the following:
   a. Blood inventory needs
   b. Critical equipment and supplies inventory needs
   c. Availability of laboratory staff (labor pool)
6. Interacting with divisional laboratories and services to do these:
   a. Communicate laboratory-specific needs
   b. Relay information to laboratories
   c. Establish frequency, time, and location of briefing meetings

The intermediate actions include these:

1. Identifying whether phlebotomy services are needed
2. Identifying whether pneumatic transport tube system is available
3. Determining whether point-of-care testing is needed and if so doing these:
   a. Determine the type of testing needed
   b. Identify teams to travel to testing locations
4. Delegating human resources, communications, and transportation

The extended actions include these:

1. Establishing relief for leaders
2. Developing a schedule for rotation of leadership
3. Contacting the ancillary services director if any of these apply:
   a. Additional personnel are needed for staffing
   b. Family support is needed for staff
   c. Lodging is needed for staff
   d. Food and water are needed for staff

A second action sheet is used to capture information related to the emergent situation. Using this form the laboratory unit leader can capture this information:

1. Leader's name, for reference by other leaders
2. Nature and magnitude of the incident, including the expected number of patients
3. Expected duration of the incident
4. Location of the incident
5. Location of the Mayo Clinic command center
6. Name and contact number of the person who notified the laboratory unit leader of the emergent situation
7. Date of the emergent situation
8. Expected laboratory services needed
9. Location of the DLMP command center
10. Time the calling tree was activated
11. Assessment of the blood inventory
12. Assessment of any other laboratory services needed
13. Any other pertinent notes

*Specific Laboratory Actions and SOPs*

The final portion of developing the overall MEICS plan was to establish laboratory-specific action items that could be written into standard operating procedures (SOPs) for each laboratory throughout the DLMP for reference by laboratory personnel. In Transfusion Medicine we decided to incorporate the specific action items for MEICS activation into our already existing disaster plan procedure. Much like the developers of the departmental plan, we developed an evaluation checklist for the operations managers to use to assess the emergency, record decisions, define the location of the command center, and capture relevant contact information. The disaster evaluation checklist helps the operations manager capture the following:

1. Evaluation of the need for additional personnel in each work unit
2. Notification of outside blood donation testing laboratories and sample testing transportation providers
3. Evaluation of the need for external source of blood if a large supply of blood components is anticipated, computers are not functioning, or both. If the external source does not have an adequate supply, inquire about the possibility of them establishing a mobile site locally until Transfusion Medicine can resume collections
4. Determination of whether blood collection, transfusion, and processing should be discontinued for these:
   a. Therapeutic apheresis procedures (consider the need to disconnect piped-in oxygen)

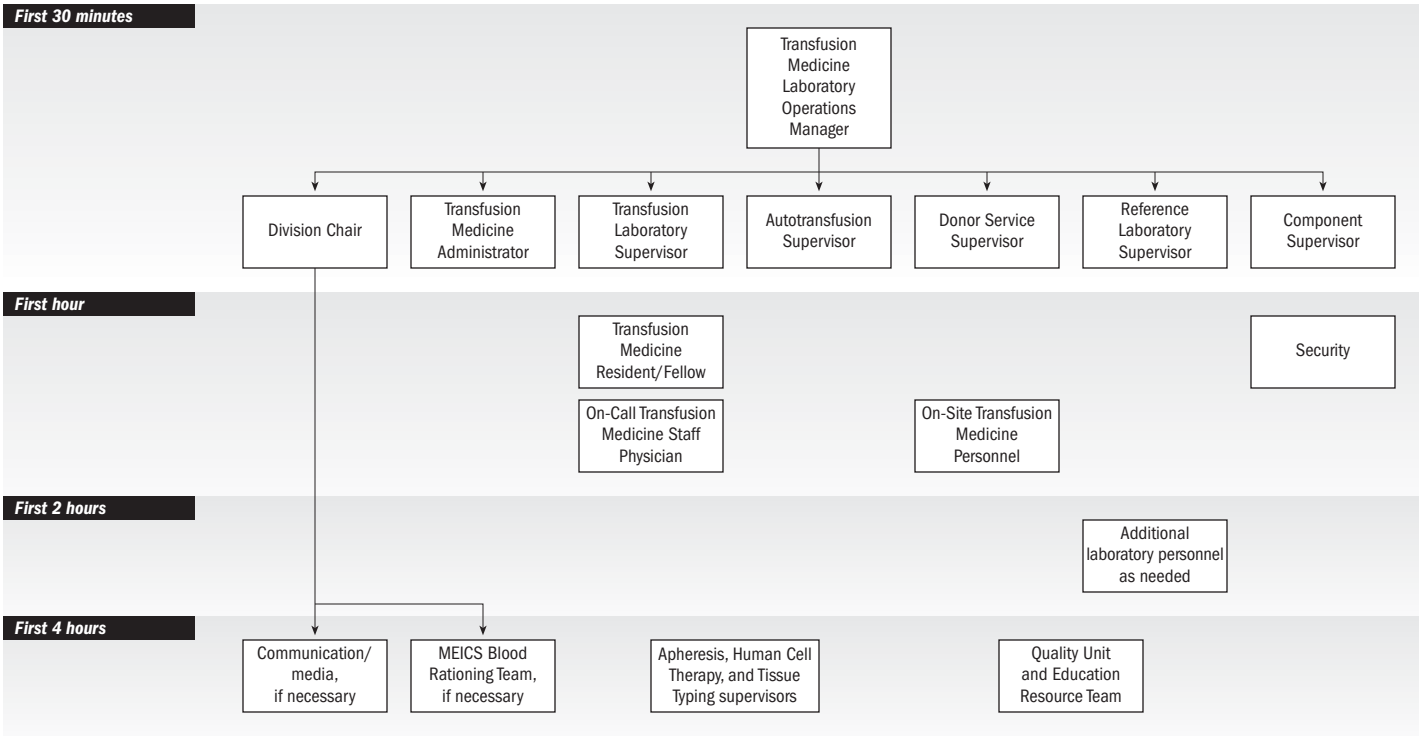


**Fig. 4. Transfusion Medicine Disaster Plan Calling Tree**
The Transfusion Medicine calling tree uses a time requirement approach to allow early notification of key emergency responders. These key responders can quickly identify the potential for any anticipated blood shortages so that the MEICS blood rationing team can be notified, if necessary.

   b. Donor services (blood collection), including fixed and mobile sites
   c. Intraoperative autotransfusion services, listing which hospital locations
5. Relocation of specific work units, if required, and the new locations
6. Relocation of blood inventory, and to where,with a specific list of locations that have the capability for large, monitored, refrigerated storage capacity
7. Any additional supplies that are needed: amount, source, date of receipt, lot number, and manufacturer
8. Determination of whether or not a blood shortage will occur and, if so, the upward communication from the Transfusion Medicine chair to the MEICS Blood RationingTeam

*Transfusion Medicine Communication Planning*

A Transfusion Medicine calling tree was developed to ensure timely notification of key response personnel. However, unlike the DLMP MEICS calling tree, which uses a tiered approach, the Transfusion Medicine calling tree uses a time requirement notification approach, indicating key contacts that should occur within the first 30 minutes, first hour, first 2 hours, and first 4 hours, as shown in Figure 4. We developed the time requirement approach to organizing our response plans in Transfusion Medicine to help us ensure that key decisions can be made about the potential for blood shortages. Communication about the potential for blood shortages needs to flow back to the MEICS command personnel and the Blood Rationing Team so that timely decisions can be made about how the remaining blood supply should be used. Likewise, decisions about public communication concerning the blood shortage must be made.

*The Blood Rationing Team*

To adequately respond to the need for blood or blood components subsequent to a natural disaster, terrorism, or internal crisis, a Blood Rationing Team was developed under MEICS. Within the MEICS organizational structure, the team reports to the medical staff chief. The development of a prescriptive blood rationing plan was not feasible because not all circumstances could be anticipated. The

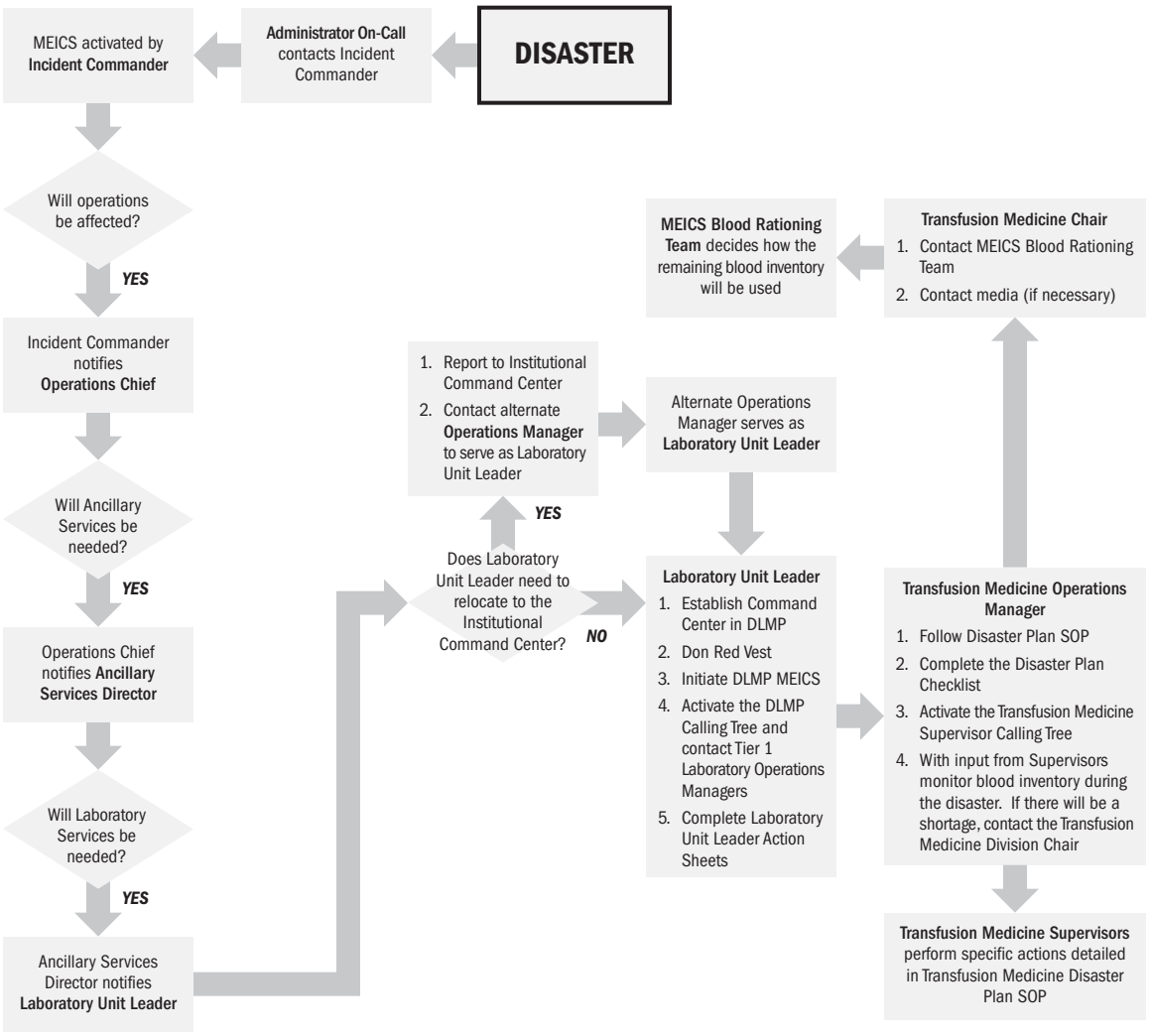


**Fig. 5.** A high-level summary diagram of how the specific pieces of the MEICS plan fit together to form a disaster response. Additional actions are listed at the laboratory unit leader and Transfusion Medicine levels to help illustrate how key actions and communications flow within the process.

Blood Rationing Team, consisting of internal experts, quickly assesses threats to the blood or blood component supply; decides how quickly and completely the blood inventory can be "recovered" to adequate levels; and proposes solutions to limit or avoid a crisis that causes, or threatens to cause, inadequate patient care. When activated, the Blood Rationing Team weighs the demands for blood or blood components against the inventory. The Blood Rationing Team triages demands and makes decisions to limit transfusions and elective surgical procedures as necessary. The Blood Rationing Team consists of chairs of each of the following: Transfusion Committee, Cardiac Surgery, Clinical Practice Committee, Ethics Committee, Hospital Practice Committee, Surgical Committee, Transfusion Medicine, Bone Marrow Transplantation, and Liver Transplantation. The Emergency Blood Rationing Team is activated any time the chair of the Division of Transfusion Medicine (or designee) determines that the supply of blood or blood components is sufficiently low to threaten the ability to meet patient needs. The chair of the Division of Transfusion Medicine (or designee) activates the Blood Rationing Team by requesting that the telephone operator notify team members of an emergency meeting, including time and location. The MEICS incident commander (or administrator on call) is also notified.

### *Transfusion Medicine Flowcharts and SOPs*

Flowcharts for each work unit within Transfusion Medicine were also developed to reflect key steps in

the disaster plan SOP. As in the calling tree, a time requirement approach was used to organize the key response steps in the flowcharts and to help identify in the early stages of the disaster any potential for blood shortages or the need to discontinue or increase blood collections or services. In addition, the time requirement approach used in the flowcharts and disaster plan procedure allows us to identify within the first hour of a disaster the need to contact our outside blood suppliers for additional support, the need to relocate laboratories and personnel, the need to call in additional personnel, and the possible need to activate the AABB disaster plan.[5]

## Discussion

At the 2007 AABB annual meeting workshop on disaster planning, participants learned about the importance of planning for disaster management to maintain continuity of operations in various emergency and disaster-related events. Various speakers emphasized how most disasters are "managed at the local level." Organizations conducting disaster planning exercises need to develop interfaces and understand how they will interact with emergency responders at the local, state, and national levels when responding to the cycle of disaster management.[6]

With proper planning and consideration of the key factors important in managing the various aspects of disasters, organizations can mitigate untoward consequences that can prevent them from continuing vital operations such as maintaining a readily available blood supply. We have been able to successfully develop a MEICS plan with several key features. These include coordination with national and local response plans, generic flexibility to deal with multiple scenarios, an established chain of command, a list of key response personnel and their responsibilities, a process for contacting key response personnel using a calling tree, defined roles during a MEICS activation for each laboratory—including Transfusion Medicine—and action sheets to assist in resource analysis and decision making. A high-level summary diagram of how the specific pieces of the plan flow together to form a disaster response is provided in Figure 5 to illustrate how information, communication, and some key actions might be handled, especially within Transfusion Medicine. Although the disaster response plan described here is specific to Mayo Clinic, the general key concepts, processes, and considerations of disaster planning, especially Transfusion Medicine response planning, can be applied by almost all major health care institutions.

Subsequent to the drafting of this manuscript, Mayo Clinic Rochester has adopted the National Incident Management System (NIMS) under the Hospital Incident Command System (HICS).[7] This has had no effect on the plans that have been described in this manuscript. Mayo Clinic Rochester had previously been working towards NIMS compliance under the directives and guidance set forth by the Federal Emergency Management Agency in September 2006 as described in the *NIMS Implementation Activities for Hospitals and Healthcare Systems* document.

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